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ABSTRACT

A study investigated the cognitive and grammatical activities carried out during writing by 22 incoming freshmen and 20 upperclass college students. It was hypothesized that the upperclassmen's compositions would be judged better in quality than those of the freshmen, and that the upperclassmen would show fewer pauses in which they were considering grammatical issues than would the freshmen. Subjects were videotaped as they wrote on one of six topics, after which they were prompted with the videotape for comments about their writing activities. Papers were scored on content, organization, and surface elements. Upperclassmen received significantly better ratings than freshmen on both content and organization, but not on surface elements, which lent partial suport to the first hypothesis. Analysis of the videotapes and protocols revealed that while freshmen and upperclassmen showed a similar number of pauses during writing, the freshmen paused for longer periods of time. Although participating in the same number of grammatical activities, the two groups did differ in their total number of cognitive activities. The results demonstrated that freshmen and upperclassmen differed in the quality of their final products and in their degree of skill in carrying out writing processes. The results also indicated the fruitfulness of monitoring pausal activities to track writing processes without interrupting them. (HTH)

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Cognitive Processes During Pauses in Writing

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Two major approaches have emerged for investigating the processes involved in writing - interviews and protocol analysis. The interview approach has subjects reconstruct part of the writing process from memory after the process is completed. This usually results in generalized rather than specific observations by the writer.

Protocol analysis offsets these problems by having subjects comment as they are writing. However, this approach introduces the

CS 207885

problem of cognitive capacity. Saying aloud all that is being carried out induces a load on working memory. Both writing and producing the protocol can thus raise problems of interference.

A writing methodology which removes the cognitive processing restrictions while still permitting specific comments about the writing task could be very useful. One possibility is modifying the prompted recall procedure designed for memory tasks. One way to do this in writing is suggested by some recent research on macro reading strategies(Klare and Schumacher, 1981; Schumacher and Moses, 1982; and Schumacher and Young, 1981). These researchers used a specially constructed platform and a videotape system to record facial expressions, eye movements and reading activities without interrupting the subjects. Modifying this procedure slightly allows subjects to be videotaped as they write a paper. Immediately after the writing session subjects are prompted with the videotape for comments about their writing activities. Such specific prompts allow subjects to make relatively specific observations about their mental activities during writing with a high degree of certainty.

This paper covers a study using this methodology to investigate the cognitive and grammatical activities carried out by beginning freshmen and upperclass college students during writing. Based on experience and on prior studies of writing, it was hypothesized that the upperclassmen's compositions would be judged better in quality than those of the freshmen. In addition, it was expected that the upperclassmen would show fewer pauses in which they were considering grammatical issues than would the freshmen.

Method

Subjects

The beginning students were 22 high school graduates enrolled to enter a university within two months. The upperclass students were 20 students in an advanced composition course taught by the English Department. The students were primarily juniors and seniors. All participants were volunteers.

Experimental Materials

Two special types of materials were used - the writing assignments and the categories of writing activities. All students were given a choice of six topics for their writing assignments. Freshmen had rated these the most interesting of a large set of potential topics studied by Klare and associates (Entin, 1980). The six topics were

Keeping physically fit;

What happens when we sleep;

How emotions help and harm us;

Attitudes toward death;

Why we forget; and

The nature of personality.

Just prior to reviewing the videotape of their writing, students were shown a list of activities which they might possibly carry out during any pause in writing. The list described each activity and gave two typical questions to exemplify each. For example, one cognitive activity was "Effect on Reader." The description was: Imagining or picturing how the reader might react, especially in terms

of accepting or believing my message. The questions were: Will my reader believe this? or Will this information have the effect I want?

There were 11 cognitive and four grammatical activities. The cognitive activities were: effect on reader, global planning, immediate planning, transitions, reorganizing, sound, illustrations, support, reviewing own experience, reviewing topic, and reviewing the content. The grammatical activities were spelling, word choice, punctuation and capitalization, and sentence structure. These categories had been developed over a series of pilot studies.

Apparatus

The students wrote their papers on a platform located about six inches beneath a parallel sheet of semisilvered glass. With approoriate lighting this glass appeared transparent. The subjects could move their hands freely under the glass and could easily write, erase, or cross out materials. This device was developed by Pugh(1979) and was a modification of a device originally conceived by Karslake(1940).

A videotape camera was positioned above the subjects' shoulders. This recorded the developing paper through the glass and a reflection of the subjects' face and eyes from the glass. For reviewing the videotape a set of Hunter timers was linked with the videotape recorder, an audio recorder and a manually controlled switch. By flipping the switch on as a pause began during the tape review, the experimenter initiated an automatic timing sequence. If the switch was not flipped off again by the experimenter within 10 seconds (signalling the end of a short pause), the timers automatically

stopped the videotape and started an audiotape. The audiotape recorded all comments while the videotape was stopped. The experimenter then restarted the tape-review process by flipping the switch off.

Procedure

Upon arrival the subjects were seated, told that they would be writing a paper for half an hour, and told that their writing activities would be recorded. They were also told that performance on the paper would be of importance to their course grade (upperclassmen) or their placement in the composition training program (freshmen). They were informed their essays would be judged on standards including content, organization, and grammatical features. They were also told that the experimenter would leave the room so as not to disturb them, that they should plan before they wrote and that they should not waste valuable time on neatness. Finally, they were given the six topics to choose from. At that time the experimenter turned on the videotape system and left the room.

After 30 minutes the experimenter returned to the room and gave the subjects further instructions. They were asked for their help in telling what they were thinking at various times in the writing process. The list of possible thinking and grammatical activities was given to the subjects and gone over carefully with them. They were told they would be asked during each pause of at least 10 seconds to look at the list and indicate which of the activities described their thinking. They were told that any number of activities could be indicated and if they were doing some activity not listed they should

say what it was. After answering any questions the experimenter replayed the tape for the subjects. At each pause of at least 10 seconds the subjects indicated which activities were being carried out and the experimenter recorded these on a coding sheet.

Results

Quality of the Writing Product

Two judges scored each paper independently on a five-point scale on each of three dimensions - content, organization and surface elements. A series of independent ratings followed by discussions yielded accord on all ratings.

The finalized ratings were analyzed by an analysis of variance with factors of school class (freshmen,upperclassmen) and evaluation dimension (content, organization, surface elements). Both the main effects for class, $F(1,40) = 7.9$, $p<.01$, and evaluation dimension, $F(2,80) = 9.9$, $p<.001$, were significant. However, since the interaction between these factors was also significant, $F(2,80) = 3.71$, $p<.05$, further interpretation of the main effects was not appropriate (see Figure 1). Posttests on the interaction showed that upperclassmen received significantly better ratings than freshmen on both the content and the organization measures but not on surface elements. This lends partial support to the hypothesis that the upperclassmen would produce better compositions than the freshmen. Table 1 provides means and standard deviations for the ratings on these measures (as well as others reported below).

Writing Processes

To investigate the writing processes several different cumulative dependent measures were abstracted from the videotapes and the coding sheets. These included:

Total grammatical activities - the total number of all the grammatical activities listed on the coding sheet;

Total cognitive activities - the total number of cognitive activities listed;

Total of all activities - the total of the above two categories;

Total pauses - the total number of times the subjects paused for at least 10 seconds during the writing period;

Length of pause - the length of time for each of the pauses of 10 seconds or more.

In order to test the hypothesis that freshmen would carry out more grammatical activities, an analysis of variance of the Total Grammatical Activities was conducted. This analysis showed that the freshmen did not report carrying out more grammatical activities than the upperclassmen, $F(1,40) = .04$, $p > .05$. Thus the hypothesis on grammatical activities was not supported.

In order to determine if freshmen and upperclassmen differed on the number of cognitive activities during writing, an analysis of the Total Cognitive Activities measure was conducted. This analysis yielded a significant effect of the class level, $F(1,40) = 5.1$, $p < .05$, with upperclassmen reporting an average of 29.8 cognitive activities per writing session compared to 19.6 for freshmen.

An analysis of variance on the Total Number of Pauses did not find a significant difference between freshmen and upperclassmen, $F(1,40) =$

.63, $p>.05$. However an analysis of Pause Length did show a difference between these groups, $F(1,40) = 5.10$, $p<.05$ with freshmen taking an average of 31.1 seconds per pause while the upperclassmen took only 25.3 seconds per pause.

Discriminant Function Analysis

In order to determine which variables maximally discriminated the freshmen from the upperclass writers, a discriminant function analysis was carried out using all of the above variables. The two variables which proved to be maximally discriminating were the Organization score of the final paper and the Total Cognitive Activities measure.

Specific Writing Activities

Table 2 presents the mean performance of both the freshmen and upperclassmen on each of the cognitive and grammatical categories. The most frequently used cognitive categories were Immediate Planning and Review of Content. The most frequently used grammatical category was Word Choice. Although several categories showed a trend toward greater use by the upperclassmen as compared to the freshmen, the most dramatic difference between the two groups occurred in the Immediate Planning category.

Discussion

Recently, researchers have become interested in exploring not only the outcomes from a writing task but also the processes

individuals use in composing their documents. One of the principal goals of this study was to determine if the processes of writing were similar for freshmen and upperclassmen. Several different analyses were relevant to this question. The finding that freshmen and upperclassmen did not differ on the number of pauses might suggest that they do not differ significantly in the kinds of activities they carry out. This, however, was not the case.

Two additional findings speak to this issue. First, though the upperclassmen and freshmen did not differ on the total number of grammatical activities, they did differ on the number of cognitive activities carried out. Second, freshmen actually took significantly longer pause breaks than the upperclassmen, which indicates that the difference in carrying out the cognitive activities is even greater than the mean difference between the groups would suggest. This pattern of results suggests that the upperclassmen appear to have developed a greater level of automaticity on these tasks (Moates and Schumacher, 1980).

In contrast to the cognitive activity results, the findings of a non-significant difference in number of grammatical activities and in ratings on surface elements suggests that the freshmen and upperclassmen do equally well (perhaps equally poorly) on this measure. The generally low level of performance on this measure may have been due to the task situation and the instructions which may have fostered less careful performance in this area.

Flower and Hayes(1981) have argued that planning activities are an especially important part of the writing process. The results of this study do support this notion in that planning activities

constituted a major part of the reported cognitive activities in writing. The fact that immediate planning is by far the most commonly noted activity suggests that the planning was of a short-term character rather than long-term. It is probable, however, that the type of planning was heavily influenced by the writing situation.

The results of this study demonstrate clearly that freshmen and upperclassmen differ in two major measures of writing - the excellence of the final product, and the degree of skill in carrying out the processes involved in writing. The discriminant function analysis indicates that these two characteristics are relatively independent of each other.

Finally, the results of this study indicate that the technique of monitoring pausal activities can be fruitful in investigating writing processes. It provides a window on the cognitive activities underlying the writing process, and permits writers to make confident judgments without having to interrupt the ongoing character of that process.

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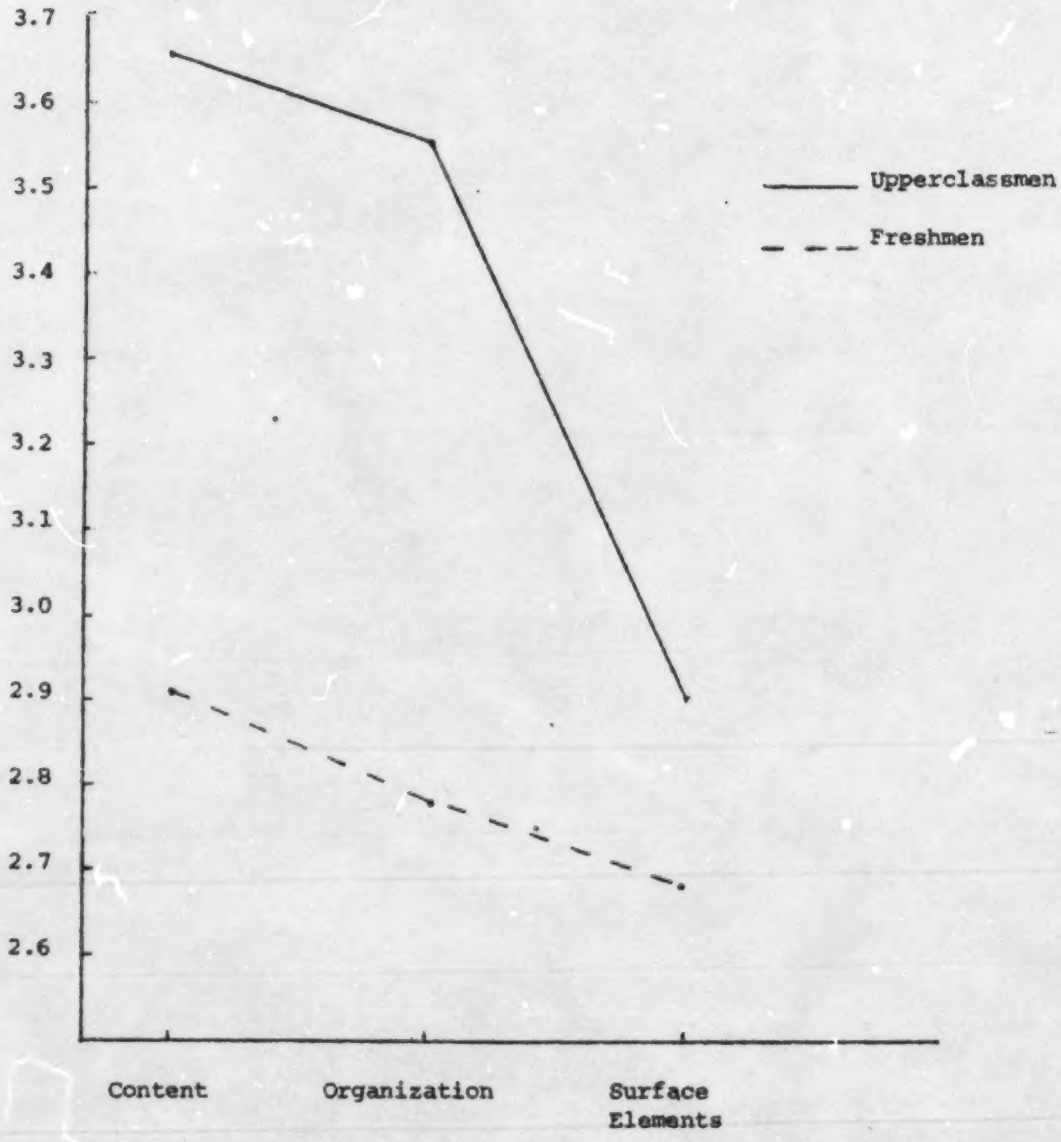

Figure 1 Mean rating scores on final written paper

Table 1

Means and Standard Deviations of Freshmen and Upperclassmen

on Cumulative Measures

	Content	Organ-ization	Surface Elements	Total Gram	Total Cog	Total All	Total Pauses
Freshmen	2.90 (.68)	2.77 (.69)	2.68 (1.13)	6.59 (5.24)	19.55 (10.43)	26.14 (13.55)	15.68 (6.17)
Upperclassmen	3.65 (.61)	3.55 (.51)	2.90 (.91)	6.25 (6.31)	29.75 (18.06)	36.00 (21.00)	14.40 (3.98)

Table 2

Means and Standard Deviations of Freshmen and Upperclassmen on Writing Measures

	Effect on Reader	Global Planning	Immediate Planning	Transitions	Reorganization	Sound	Illustrations	Support
Freshmen	1.05 (.95)	1.55 (1.84)	4.14 (2.44)	1.23 (1.45)	1.18 (1.30)	2.27 (2.37)	.91 (1.11)	1.64 (1.33)
Upperclassmen	1.40 (1.60)	2.50 (1.96)	7.05 (4.07)	2.65 (2.43)	1.30 (1.72)	2.25 (3.37)	1.55 (1.61)	2.85 (2.72)

	Review Experience	Review Topic	Review Content	Spelling	Word Choice	Punct. Capital.	Sentence Structure
Freshmen	1.23 (1.31)	1.55 (1.92)	2.82 (2.92)	.68 (.89)	3.82 (2.81)	.36 (.79)	1.73 (1.93)
Upperclassmen	1.40 (1.47)	2.85 (2.64)	3.95 (3.30)	.65 (.93)	3.20 (2.80)	.50 (1.10)	1.90 (2.61)